

North to South Variation in Cascadia Basin Channel Pathways and Turbidite Event History: Implications for Paleoseismicity

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Swath bathymetry, sidescan sonar imagery, high-resolution seismic profiles, and AMS radiocarbon ages of turbidites in channel pathways of Cascadia Basin have been utilized to help understand the paleoseismic record of the Cascadia subduction zone. Cascadia Channel has an approximate 600 yr periodicity of 13 turbidite events since deposition of the first turbidite with Mt. Mazama glass about 7500 calendar years ago. In northern Astoria Channel, no turbidite events younger than about 4300 years ago are evident even though imagery shows that the channel pathway is open and Columbia River sediment input to Astoria Canyon is equal to that of the Washington canyons feeding Cascadia Channel. In contrast, the northern Base-of- Slope channel splaying east from Astoria channel has been blocked by slumping and active faulting; also, Astoria Channel south of 44° N has been filled because of blocking by the 100 km-long Heceta slide about 100,000 years ago and the 25 km-long 44 N slide about 11,000 years ago. The Rogue Canyon mouth as well exhibits filled channels, but 7 post-Mazama turbidite events derived from a local Klamath terrane mineral source are evident. On the California margin, the Trinidad Canyon mouth exits into a 75 m deep "plunge pool" that evolves for 13 km downstream into sediment waves with maximum 40 m height 3,000 m length. Eel Canyon mouth also exits into a sediment wave field (maximum 65 m height and 5,000 m length) that leads 24 km downstream to a 37 km channel-levee complex that is 2.5 km wide with 20 m maximum relief. This channel floor cannot be cored, apparently because of a thick turbidite sand at the surface, but 14 turbidite beds are found in the upper 1.5 m of the levee. Mendocino Channel meanders along the base of the escarpment at the southern edge of Cascadia basin and contains 4 turbidite beds deposited between 100- 250 years ago based on ²¹⁰Pb activity and AMS ages.. Numerous turbidity-current events in channel pathways that were active during the late Holocene suggest

that that there is at least an order of magnitude difference in paleoseismic activity between the northern (600 y events) and southern Cascadia Basin (< 60 y events).